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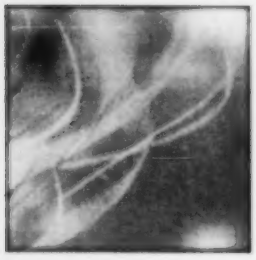
Self-reported Violent Delinquency and the Influence of School, Neighbourhood and Student Characteristics



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Self-reported Violent Delinquency and the Influence of School, Neighbourhood and Student Characteristics

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.	not available for any reference period
..	not available for a specific reference period
...	not applicable
0	true zero or a value rounded to zero
0s	value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
p	preliminary
r	revised
x	suppressed to meet the confidentiality requirements of the *Statistics Act*
E	use with caution
F	too unreliable to be published

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Abstract

This study examined the influence of school, surrounding neighbourhood—defined as the area within one-kilometre of a school—and student characteristics on the likelihood of student violent delinquency. Based on data from the International Youth Survey (2006), findings indicated that there was significant variation in violent delinquency among students in grades 7, 8 and 9 across a sample of Toronto schools. This variation was explained primarily by characteristics of the students themselves. However, the school climate, or the perceived atmosphere in the school also explained a statistically significant part of the variation in violence. Moreover, a higher level of school capital (positive feeling toward the school) reduced students' chances of self-reported violent behaviour over and above any of their own risk factors. In contrast, the findings did not support the contention that the level of crime and/or socioeconomic disadvantage in the neighbourhoods surrounding schools had an influence on students' violent behaviour. Explanations for this finding may reflect factors such as the definition of neighbourhood areas used in the study, the greater importance of more immediate environments on students' behaviour, or the possibility that neighbourhood conditions impact students' behaviour indirectly through their influence on factors such as parenting.

Self-reported Violent Delinquency and the Influence of School, Neighbourhood and Student Characteristics

by Robin Fitzgerald

1 Introduction

In 2008, the Toronto District School Board (TDSB) released the report of an advisory panel on school violence called *The Road to Health: A Final Report on School Safety*. The work of the panel was precipitated by the shooting death of a Toronto student, Jordan Manners, and what the panel described as "... a community-wide crisis of confidence in the ability of the TDSB to ensure violence-free environments in all of its schools" (School Community Safety Advisory Panel 2008, 1). In part, the panel pointed to the importance of the broader community contexts in which schools are situated in attempting to understand school violence, suggesting that,

> Schools inevitably mirror the communities they serve. In a large urban setting such as Toronto, these communities are not hermetically sealed and schools across the city have a wide range of students from all walks of life. This necessarily means that the ills that our communities face outside the schools will and have made their way into the schools (2008, 2).[1]

The extent of differences among Toronto schools in the prevalence of students' violent behaviour, and what factors might explain these differences has not been empirically tested. While many Canadian studies have considered whether youths' own characteristics—for example, their gender, age, school achievement, family or peer relationships—are related to their chances of engaging in various forms of delinquency (Savoie 2007; Sprott et al. 2000; Zeman and Bressan 2008), few have considered the possible influence of broader school and community contexts. Nonetheless, there is reason to expect that conditions within schools, and within the neighbourhoods in which schools are located, may contribute to youth delinquent behaviour.

With respect to the influence of schools, numerous studies have found a positive association between schools' environments and the behaviours and outcomes of students who attend them (Lawrence 2007; Gottfredson 2001; Gottfredson, Gottfredson, Payne and Gottfredson 2005). Apart from factors such as funding, resources and location, the school climate, or "the 'feel' of a school as perceived by students and teachers," has also been shown to be linked to behavioural outcomes among students (Lawrence 2007, 138). In particular, schools characterized by a more positive climate (e.g., a perceived high level of student and teacher interest and engagement) have lower rates of student problem behaviours, while schools characterized by a negative climate (e.g., a perceived lack of school safety or a high level of physical damage or vandalism) have higher rates of problem behaviours (Gottfredson et al. 2005; Payne, Gottfredson and Gottfredson 2003).

Research evidence also suggests that students' behaviour may be influenced by the local areas surrounding schools. For instance, studies of youth in American cities suggest that at least two characteristics of the community near a school may influence student delinquent behaviour. First, youth who are exposed to high violent crime rates in the community have been demonstrated to be more likely to engage in violence themselves (Guterman, Cameron and Hahm 2003). Second, neighbourhood socioeconomic disadvantage has been demonstrated to be associated with

1. These sentiments were echoed in the final report on the *Review of Roots of Youth Violence* (McMurtry and Curling 2008) commissioned by the Government of Ontario. In their report, former Chief Justice and Attorney General Roy McMurtry and former Speaker of the Legislature Alvin Curling contend that "... Ontario needs to focus on addressing the roots of youth violence where they are the most entrenched and damaging: in neighbourhoods characterized by high concentrations of poverty."

lower levels of informal control, and consequently to higher levels of misbehaviour and delinquency among youth (Sampson, Morenoff and Gannon-Rowley 2002).

This research paper examines the influence of community and school contexts on students' violent behaviour. The analyses are based on information from the 2006 International Youth Survey (IYS) which measured behaviours of students in grades 7 through 9 attending a sample of Toronto schools (see 'Data sources' in the Methodology section for a description of the sample). The International Youth Survey (IYS) was conducted for the first time in Canada in 2006. This is the Canadian version of the International Self-Reported Delinquency Study conducted in over 30 countries in that same year (ISRD2 Working Group, 2005).

The aim of the paper is to examine, first, whether there are significant school differences in the likelihood of engaging in violent delinquency among students in grades 7 through 9 in Toronto, and, second, whether these between-school differences can be explained by (1) characteristics of schools or the neighbourhoods in which schools are located, or (2) the individual characteristics of the students who attend particular schools. To examine these issues, a two-level multilevel model procedure was used (see 'Multilevel analysis' in the Methodology section).

2 Findings

2.1 Description of Toronto students

Complete information for the variables used in this study was available for 3,137 students attending 149 schools in Toronto, or an average of 21 students per school. Applying student-level survey design weights indicated that this sample represented about 57,900 Toronto students in grades 7 (N=18,900), 8 (N= 19,200) and 9 (N=19,800). Students were roughly evenly split between males (52%) and females (48%) (Table 1). (see 'Weighting procedure for variance estimation' in the Methodology section for a description of weighting procedures used in this study).

Table 1
Description of student-level variables: Percentage, standard error and number of students by category

	Percent	Standard error	Number
Gender			
Male	51.7	0.009	29,950
Female [1]	48.3	0.009	27,960
Grade-level			
Grade 7	32.7	0.010	18,910
Grade 8	33.2	0.013	19,240
Grade 9 [1]	34.1	0.010	19,760
Committed at least one act of violent delinquency in past year [2]			
Yes	15.2	0.009	8,810
No [1]	84.8	0.009	49,100
Low parental monitoring [2]			
Yes	34.5	0.011	19,950
No [1]	65.6	0.011	37,960
Friends accept criminal behaviour [2]			
Yes	16.1	0.008	9,300
No [1]	83.9	0.008	48,610
Usually does not like school [2]			
Yes	22.0	0.009	12,740
No [1]	78.0	0.009	45,170
Total	**100.0**	...	**57,910**

1. Reference category in models.
2. For precise variable definitions see 'Description of variables' in the Methodology section.

Note(s): Population estimate rounded to the nearest 10; unweighted sample size = 3,137 student attending 149 Toronto schools.
Source(s): Statistics Canada, International Youth Survey, 2006.

While the majority of schools (N=137) in the sample were publicly funded, and part of the Toronto District School Board, the study also included a number of privately funded schools (N=12). It should be noted, however, that the

sample excluded private schools from the Toronto Catholic School Board, as well as special schools (see 'Data sources' in the Methodology section). Since included private schools accounted for about 8% of sampled schools and the aim of the study was to assess variation in violence among students in grades 7, 8 and 9 across all schools in Toronto, the private schools were retained in the analytical sample.

Students were asked about their involvement in violent delinquency including acts of robbery, weapon possession, threatening, group fighting, intentional injury using a weapon, or cyberbullying intended to harass or frighten others (see 'Description of variables' in the Methodology section for details). A majority of students (85%) reported that they had committed none of these violent acts in the past 12 months; however, the remaining 15% (about 8,800 students) reported that they had engaged in at least one act of violent delinquency over the period (Table 1).

Across the whole sample, most students **did not** report that they had characteristics or were exposed to circumstances that have been associated in many studies with higher chances of delinquent behaviour—i.e., poor parenting strategies, delinquent or criminal attitudes among peers, and low school attachment. Nonetheless, about one-third of students (35%) reported that their parents (or guardians) only "sometimes", "rarely" or "never" knew who they were with when they went out. About one in six students (16%) indicated that they spent time with a group of friends for whom "doing illegal things (against the law)" was accepted. In addition, just over one in five students (22%) reported a low level of attachment to school, or that they usually did not like school "very much" or "at all".

2.2 Description of Toronto schools

The 149 schools in the sample were selected to ensure an even dispersion of schools across the Toronto area. The study considered the relationship between characteristics of both the local area surrounding schools and the environment within the schools.

School-neighbourhoods– To assess the relationship between delinquency and neighbourhood conditions, a 'school-neighbourhood' with a one-kilometre radius was calculated for each school (see 'Map 1: Illustration of school buffer zones for Toronto schools' and 'Definition of school-neighbourhoods' in the Methodology section). It should be noted that the concept of the school-neighbourhood used in this study measured the environment near schools, rather than either the students' residential neighbourhoods or the school catchment area since this information was not available. While, it is reasonable to expect that there would be some overlap between school-neighbourhoods defined in this study, students' residential neighbourhoods, and/or the school catchments, the results should not be confused with an assessment of the influence of where the student lives on his or her behaviour.

Within each school-neighbourhood the levels of socioeconomic disadvantage and police-reported crime were estimated based on data from the 2006 Census and the 2006 Incident-based Uniform Crime Reporting Survey. The level of socioeconomic disadvantage for school-neighbourhoods was derived from a set of five variables (see 'Description of variables' in the Methodology section). Looking at these variables individually shows that there was substantial variability across school-neighbourhoods in their socioeconomic make-up. For instance, the average unemployment rate across all school-neighbourhoods in the sample was about 7.6% (a figure that reflects the unemployment rate for the City of Toronto as a whole in 2006), but this neighbourhood rate ranged from a low of about 3.6% to a high of 12.2%. Similarly wide ranges were evident for the percentage of total neighbourhood income that came from government transfers, the percentage of female lone-parent families, the percentage of non high school completers, and the percentage of persons living in low-income families (Table 2). In addition, the neighbourhood police-reported crime rate varied across neighbourhoods from a low of about 7 incidents per 1,000 people to a high of 141. The average rate across all school-neighbourhoods was 38 incidents per 1,000.

Table 2
Description of school climate and school neighbourhood characteristics

	Number of schools	Mean	Standard deviation	Minimum	Maximum
	number	mean	percent		
Characteristics of school neighbourhoods					
Socioeconomic disadvantage [1]					
Percent unemployed	149	7.6	1.8	3.6	12.2
Percent government transfers in total income	149	11.6	4.9	0.9	23.5
Percent female lone-parent families	149	16.8	5.2	5.9	32.8
Percent no high school certificate (those aged 20 years and older)	149	17.2	8.3	3.2	41.8
Percent low-income families	149	22.9	9.2	3.1	49.8
	number	mean	rate		
Police-reported crime rate per 1,000 population [1]	149	38.4	20.7	7.1	141.0
	number	mean	school climate scores		
School climate					
School capital [1]	149	1.7	0.2	1.3	2.7
School disorder [1]	149	2.2	0.4	1.1	3.3

1. For precise variable definitions see 'Description of variables' in the Methodology section.
Source(s): Statistics Canada, International Youth Survey, 2006; Census, 2006 and Incident-based Uniform Crime Reporting Survey, 2006.

School climate – The study includes two measures of school climate, or the average student perception of the 'feel' of the school (Gottfredson et al., 2005; Lawrence 2007; see 'Description of variables' in the Methodology section). **School capital** includes measures of students' attachment to the school, their assessments of teacher involvement, and of the availability of activities; while **school disorder** includes measures of students' perceptions of the level of damage and vandalism, and problem behaviours among students including drug-use, theft, and fighting.

School climate scores were normally distributed across the schools in the Toronto sample. In other words, for a majority of schools, students perceived the climate to be neither very positive nor very negative, while for a minority of schools, students perceived the climate to be either very negative or very positive.

2.3 Are there meaningful differences between schools in self-reported violent delinquency?

An initial 'empty model' was calculated to test whether there were differences between Toronto schools in students' likelihood of reporting that they committed a violent act in the past 12 months (Table 3) (see 'Weighting procedure for variance estimation' in the Methodology section for details on multilevel estimation). This model contains no covariates, but simply calculates the magnitude of the variation between schools in violent delinquency. Results showed a statistically significant between-school variation in the probability of violence ($\mu_{0j} = 0.215$, $p \leq 0.05$). Further calculations illustrated the extent of this variation. In a 'typical' Toronto school, about 13% of grade 7 to 9 students reported past-year violent delinquency, but this prevalence rate ranged from a low of about 6% to a high of about 27% of students (about 95% of schools lay within this range).

Table 3
Variation in violent delinquency across schools

	Empty model	School neighbourhood characteristics model	School characteristics model	Student characteristics model	Full model
	odds ratio				
Fixed effects					
Intercept	0.15 **	0.13 **	0.06 **	0.03 **	0.01 **
School-neighbourhood characteristics					
Socioeconomic disadvantage [1]					
Low [2]	...	1.00	...	...	1.00
Middle	...	1.14	...	...	0.94
High	...	1.08	...	...	1.00
Police-reported crime rate [1]					
Low [2]	...	1.00	...	...	1.00
Middle	...	1.36 *	...	...	0.93
High	...	1.00	...	...	0.90
School characteristics					
School capital [1]					
Low	...	...	1.53 **	...	1.49 **
Middle	...	...	1.41 *	...	1.50 **
High [2]	...	...	1.00	...	1.00
School disorder [1]					
Low [2]	...	...	1.00	...	1.00
Middle	...	...	1.44 **	...	1.25
High	...	...	1.45 **	...	1.41
School status					
Public	...	...	1.70	...	1.56
Private [2]	...	...	1.00	...	1.00
Student characteristics					
Gender					
Male	...	...	...	1.96 **	1.99 **
Female [2]	...	...	...	1.00	1.00
Grade level					
Grade 7	...	...	...	1.59 **	1.85 **
Grade 8	...	...	...	1.52 **	1.68 **
Grade 9 [2]	...	...	...	1.00	1.00
Low parental monitoring					
Yes	...	...	...	3.60 **	3.53 **
No [2]	...	...	...	1.00	1.00
Friends accept criminal behaviour					
Yes	...	...	...	4.28 **	4.24 **
No [2]	...	...	...	1.00	1.00
Usually does not like school					
Yes	...	...	...	1.59 **	1.57 **
No [2]	...	...	...	1.00	1.00
	variance				
Random effects					
Variance component (μ_{0j})	0.215 **	0.207 **	0.106	0.153 *	1.076
	percent				
Prevalence and variation across schools [3]					
Average likelihood in a 'typical' school	13.2	11.4	5.8	2.6	1.2
Low prevalence	5.8	5.0	3.1	1.2	0.7
High prevalence	27.4	23.8	10.4	5.4	2.0

* statistically different from the reference category $p \leq 0.1$; or for variance components, regression coefficients in the model vary statistically among schools $p \leq 0.1$
** statistically different from the reference category $p \leq 0.05$; or for variance components, regression coefficients in the model vary statistically among schools $p \leq 0.05$
1. For this analysis, neighbourhood and school variables were divided into tertiles, or low, middle and high scores, each containing one-third of schools.
2. Reference category in models.
3. See details on calculation of prevalence and variation across schools in 'Calculating between-school variation in prevalence of violent delinquency' in the Methodology section.

Note(s): Unweighted sample size = 3,137 students attending 149 Toronto schools.
Source(s): Statistics Canada, International Youth Survey, 2006, Census, 2006 and Incident-based Uniform Crime Reporting Survey, 2006.

2.4 Do schools' neighbourhood characteristics explain school differences in violent delinquency?

The second model in Table 3 tested whether the conditions in the neighbourhoods surrounding schools accounted for any of the observed variation in average violent delinquency among schools. Specifically, the model estimated the influence of schools' neighbourhood socioeconomic disadvantage and police-reported crime rates on the mean level of violent delinquency. Results indicated that these neighbourhood characteristics did not account for a substantial amount of the variation in average violent delinquency across the Toronto schools, since the between-school variance in violence is relatively unchanged from the empty model and remains statistically significant ($\mu_{0j} = 0.207$, $p \leq 0.05$). Put another way, the results indicated that after adding the neighbourhood level variables, there was a small decrease in the prevalence rate for a 'typical' Toronto school to 11% from 13% in the empty model. In the second model the prevalence ranged from about 5% to 24%, a relatively small reduction from the empty model (6% to 27%).

For the purposes of this analysis, schools were categorized into tertiles—or low, middle and high categories each containing one-third of schools—based on their ranking for each neighbourhood and school variable. For each variable, the reference category included schools with the lowest level of the variable, or in the case of school capital, the highest level.

Odds ratios for middle and high neighbourhood socioeconomic disadvantage were not statistically different from the reference category (see 'Odds ratio' in the Methodology section). Nonetheless, both were above one suggesting that schools situated in more socioeconomically disadvantaged neighbourhoods were associated with higher average probabilities of violent delinquency. There was also some evidence that schools situated in neighbourhoods with higher police-reported crime rates were associated with higher school violent delinquency. In this case, the odds ratio for the middle level of neighbourhood crime was different than the low crime-rate reference category (1.36, $p \leq 0.1$); however, there was no statistical difference between the highest crime rate neighbourhoods and the reference category.

2.5 Does school climate explain between-school differences in violent delinquency?

The third model in Table 3 showed that school climate accounted for a considerable amount of the variation in between-school violent delinquency. After including variables measuring school capital and school disorder, the variance in school violence decreased and became statistically non-significant ($\mu_{0j} = 0.106$, $p > 0.1$). This was also reflected in the substantial drop in the prevalence of violent delinquency in a 'typical' school (6%) from the figure estimated in the empty model (13%).

Odds ratios indicate that both measures of school climate were associated with the chances of engaging in violent delinquency across schools. First, attending a school with a **lower** level of **school capital**—a measure of student commitment, teacher engagement with students and available activities—increased the likelihood of violent delinquency. For example, students attending schools with the lowest level of school capital had odds of violent delinquency about 53% higher than those attending schools with the highest level of school capital. Second, attending a school with a **higher** level of **school disorder**—a measure of the level of damage, vandalism and problem behaviours in their schools—increased the likelihood of violent delinquency. In this case, students in schools with the highest and middle levels of perceived disorder had odds for delinquency that were about 45% and 44% (respectively) higher than those in schools with the lowest level of disorder.

2.6 Do student characteristics explain school differences in violent delinquency?

The fourth model in Table 3 assesses whether the between-school variation in delinquency could be explained by the characteristics of the students who attended the Toronto schools. The results indicated that these five student-level variables were important to understanding the likelihood of engaging in violent delinquency. As might be expected from previous studies, estimates showed that being male and younger (i.e., in a lower grade) increased students' chances of engaging in violence, as did students' lack of attachment to school. Most notably, however, students

whose parents were not rigorous monitors of their friends and acquaintances had odds of violent delinquency that were over three times higher than students whose parents were rigorous monitors. And, those with a group of friends who accepted "illegal" behaviour had odds that were over four times higher than those without such a group of friends.

The results in the fourth model also demonstrated that much of the between school variation in violent delinquency was attributable to the student-level characteristics. The prevalence of school violent delinquency in a typical school dropped to 2.6% of students after adjusting for the student-level variables. While this was a considerable drop from the average prevalence rate calculated in the empty model (13%), it should be noted that the variance component remained statistically significant ($\mu_{0j} = 0.153$, $p \leq 0.1$) in the student-level adjusted model, suggesting that student characteristics do not capture all of the between school variation in violence.

2.7 Do school or neighbourhood characteristics explain school differences in violent delinquency over and above student-level characteristics?

The aim of the final model in Table 3 was to assess whether characteristics of schools, or the neighbourhoods in which they were situated, influenced violent delinquency over and above students' individual risk factors. After accounting for the other study variables, only **school capital** was associated with violent delinquency. Attending a school with the lowest or middle levels of perceived school capital increased the odds of reporting violent delinquency by about one-half (49% and 50%, respectively) over attending a school with the highest level of school capital. Put in other terms, given the same individual-level risk profiles, students chances of committing violent delinquency were reduced if they attended a school with the highest level of school capital where students perceived high levels of student commitment, teacher engagement with students and available activities.

None of the other school or school-neighbourhood variables accounted for significant variation in violent delinquency in the final model. This finding indicates that after adjusting for student-level risk factors, these external conditions did not directly influence students' chances of reporting that they committed violent delinquency, nor explain school differences in average violent delinquency.

Adjusting for both student- and school-level variables in the final model also significantly reduced the variance in average violent delinquency between schools. The prevalence of violent delinquency in a 'typical' Toronto school dropped from 13% in the empty model to 1% in the adjusted model. And this rate ranged from a low of less than 1% to a high of 2%.

3 Summary of results and discussion

Despite the suggestion that there are wide variations in student violent behaviour across Toronto schools, and that these differences may be at least partially explained by the conditions within schools or within their surrounding communities (School Community Safety Advisory Panel 2008), the proposition has not been empirically tested. Based on data from the 2006 International Youth Survey (IYS) of students in grades 7 through 9 attending a sample of Toronto schools, this research paper assessed school differences in self-reported student violence and factors that best explained those differences.

The findings indicated that there were statistical differences between schools in the average likelihood of students' reports of engaging in violent delinquency. In an average Toronto school about 13% of students in grades 7 through 9 reported that they had committed at least one violent act in the past year, but this figure ranged from about 6% of students in some schools to about 27% of students in others. The differences between schools suggest that violent delinquency cannot be attributed solely to the characteristics of individual students; rather, conditions associated with schools and the areas in which they are located may also play a role.

The results were consistent with other research showing that individual-level risk factors related to rigorous parental monitoring, delinquent or criminal attitudes among peers, and low school attachment were strongly associated with violent delinquency. However, there was evidence in this paper to suggest that the school climate influenced students' violent behaviour over and above their own risk factors. In particular, after accounting for individual-

and school-level variables, greater school capital, or positive feelings about schools' students, teachers, and activities, was associated with a decreased likelihood of violent delinquency. These results coincide with research on the importance of school attributes such as high student and teacher engagement, strong relationships, and perceived support among students in explaining student behaviour and achievement (Gottfredson 2001; Gottfredson et al. 2005; Lawrence 2007; Payne, Gottfredson and Gottfredson 2003; Welsh et al. 1999). In addition, the independent effect of school climate in this study is in line with research demonstrating that school authorities are able to reduce the level of violence in schools through strategies aimed at improving factors associated with school climate (McEvoy and Welker 2000).

Contrary to expectations, there was no evidence in this study that the level of socioeconomic disadvantage or the police-reported crime rate in the neighbourhood areas surrounding schools explained school differences in violence. Findings from other studies are mixed. Though many studies have concluded that these neighbourhood conditions in particular are directly or indirectly associated with greater chances of youth delinquent behaviour (see Sampson, Morenoff and Gannon-Rowley 2002), other studies have concluded that neighbourhood conditions are not associated with forms of student delinquency such as carrying weapons to school (Watkins 2008; Wilcox and Clayton 2001) or committing serious property crime (Welsch, Greene and Jenkins 1999). It is important to note, however, that the statistically insignificant association between neighbourhood conditions and student violence observed in this study does not constitute support for the reverse finding that there is **no** relationship between neighbourhood conditions and student violence. Possible explanations for the null finding in this study may be due in part to measurement error and/or the operational definition of neighbourhood boundaries and variables used in this study.

In particular, the school-neighbourhood was defined in this study as the environment within a one-kilometre radius of a school, rather than the students' residential neighbourhood or the schools' catchment areas. Although there is likely overlap in the geographic areas covered by these definitions, they cannot be considered to be synonymous, and consequently, the results presented in this study do not reflect an assessment of students' residential neighbourhood on his or her behaviour. Future work should investigate possible differences in the influence of these different definitions of neighbourhood on delinquent outcomes among Toronto students.

Nonetheless, it is also possible that the lack of association between school-neighbourhood and student violence reflects the greater importance of more immediate environments such as schools, than more distant environments such as neighbourhoods, on the development and well-being of youth (Bronfenbrenner 1979). Neighbourhood environments may influence young people in a more indirect manner. As an example, some evidence suggests that high-risk neighbourhood environments indirectly influence youth outcomes through the constraints placed on their parents (Briggs 1998). Further research is required to understand the ways that parents, families, peers, or schools themselves, may affect the relationship between neighbourhood conditions and student outcomes.

4 Methodology

4.1 Data sources

4.1.1 International Youth Survey (IYS)

The IYS was administered to a sample of students in grades 7 through 9 in Toronto. The survey included youths attending public schools in the Toronto District School Board (TDSB) or private schools in the Toronto metropolitan area in April and May 2006. In addition to a number of delinquent behaviours, the survey content covered a range of factors previously demonstrated to be associated with delinquency from individual, family, peer, school and neighbourhood domains.

The target population represented about 60,000 students. It excluded students from the Toronto Catholic School Board since this board declined to participate in the study. Students from the Catholic Board were estimated to represent roughly 25% of the student population in the Toronto metropolitan area. Also excluded were youths who had dropped out of school or who attended special schools.

The IYS data were gathered using a stratified sampling design. Based on consultation, Statistics Canada used two variables for stratification—grade and two geographic areas—resulting in six strata. The geographic areas were based on postal codes and were split in such a way as to ensure, as much as possible, equal student populations. In each stratum, schools were selected systematically with probability proportional to size, with the size measure being the school enrolment count for the grade of interest. Selection of classes was accomplished in the field by the Statistics Canada interviewer who randomly selected one class in the desired grade. For further details about stratification and sample selection see Statistics Canada International Youth Survey User Guide 2006. In total, there were 4,497 students from 176 responding schools selected. Of this number, 3,290 students (or about 73% of students) attending 149 schools completed the survey. In some cases students agreed to complete the survey but did not complete all survey items. As a result of this item non-response, the final sample size in this study was 3,137 students from 149 schools. Students completed the IYS survey in the classroom.

4.1.2 Census of Population

The 2006 Census provides the most recently available population and dwelling counts for Canada and also for smaller geographic units such as cities and areas within cities. The detailed socioeconomic data used in this study are derived from the long form of the Census, which is based on a 20% sample of households. These data exclude the institutional population, which includes individuals living in hospitals, nursing homes, prisons and other institutions.

4.1.3 Incident-based Uniform Crime Reporting (UCR2) Survey

Police-reported crime incident rates in this study are derived from a database of geocoded incidents occurring in Toronto from January to December 2006. For the purposes of analyzing the geographic distribution of crime in the city, the Toronto Police Service forwarded addresses for each incident reported and entered in the UCR2 in 2006 to the Canadian Centre for Justice Statistics. This information was resolved by CCJS into a set of geographical coordinates (X and Y) for each address. These coordinates were rolled up to the mid-point of a block-face in the case of a specific address, and to intersection points in the case of streets, parks and subway stations (see Charron [forthcoming] for further details).

4.2 Definition of school-neighbourhoods

This study examined the association between student self-reported violence and the conditions in the 'school-neighbourhood' or the area in the vicinity of the school. For each school an area with a one-kilometre radius was calculated (Map 1). Different school-neighbourhood sizes (e.g., different radius-lengths) were tested in the final models presented in this study; however, the one-kilometre radius was used since it resulted in the strongest association between neighbourhood conditions and student behaviour.

To measure the socioeconomic conditions within the school-neighbourhood, Census data for all Statistics Canada Census Blocks—i.e., single city block bounded by intersecting streets—for which the mid-point of the block was located within one kilometre of a school were summed. To measure the police-reported crime rate within the school-neighbourhood, all UCR2 crime incidents located within one kilometre of a school were summed and divided by the total population of the school-neighbourhood.

It is important to note that although a large proportion of students may have lived in the school-neighbourhoods calculated for the purposes of this study, these areas are not intended to be a measure of students' residential neighbourhoods since student addresses were not collected through the IYS. Similarly, information about the school catchments was not available for this study. In many cases the calculated school-neighbourhoods may have overlapped with the public school catchments defined by the TDSB; nonetheless, these areas should not be considered to be synonymous.

Map 1
Illustration of school buffer zones for Toronto schools

4.3 Description of variables

4.3.1 Outcome measure (violent delinquency)

Violent delinquency: a two-category outcome variable for which students were scored 1 if they reported committing at least one of six violent acts at least once in the past 12 months, and 0 if they reported none of the acts. Students were asked: "Have you ever participated in a group fight on a school playground, a football stadium, in a street, or in any other public place?"; "Have you ever threatened somebody with a weapon or threatened to beat them up to get money or other things from them?"; "Have you ever carried a weapon, such as a stick, chain, or knife (not a pocket knife)?"; "Have you ever snatched a purse, bag or something else from a person?"; "Have you ever intentionally beaten up someone, or hurt them with a stick or knife, so badly that they had to see a doctor?"; or "Have you ever sent e-mail messages intending to harass or frighten the other person?".

4.3.2 Student-level variables

Gender: Coded 1 for male and 0 for female.

Grade-level: To represent the three grade levels (7, 8 and 9) two binary dummy variables were coded for grades 7 and 8, with grade 9 serving as the reference category.

Low parental monitoring: A binary variable measuring students' assessments of parental monitoring. Students were asked: "Do your parents (or the adults you live with) usually know who you are with when you go out?" where possible responses included "Always,""Sometimes,""Rarely/Never," or "I don't go out." Students were coded 1 for "Sometimes," or "Rarely/Never" or 0 for "Always" or "I don't go out". Students who indicated that they did not go out at night were retained in this variable because they represented a relatively large proportion of the analytic sample (6%), and they were highly correlated with students who indicated that their parents always knew with whom they went out.

Friends accept criminal behaviour: A binary variable assessing whether students had a group of friends for whom "doing illegal things (against the law) was accepted". Students were scored 1 if their group of friends accepted this behaviour and 0 if their group of friends did not accept the behaviour or if they did not have a group of friends. Students indicating that they did not have a group of friends accounted for about 13% of the analytic sample. This group was retained because they were highly correlated with the group of students who indicated that their group of friends did not accept criminal behaviour.

Usually does not like school: A binary variable assessing the extent to which students reported that they "Usually liked school". In this case, students were scored 1 if they reported "I do not like it very much" or "I do not like it at all", and 0 if they reported "I like it a lot" or "I like it fairly well".

4.3.3 School-level variables: Neighbourhood characteristics

School-neighbourhood socioeconomic disadvantage: The social and economic characteristics of neighbourhoods can be defined in a variety of ways. For example, Charron (forthcoming) examines the link between police-reported crime and a range of neighbourhood characteristics defined through factor analysis of Census data at the aggregated census tract level in Toronto. The specific aim in the current study was to assess the possible influence of socioeconomic disadvantage on student violent outcomes. In particular, results from other multilevel studies have indicated that higher neighbourhood concentrations of low-income, lone-parent families, people receiving government assistance payments, unemployment and adults without high school education explain some of the variation in problem behaviours among children and youth in Canada (e.g., Boyle and Lipman 2002).

To test the specific association between concentrated socioeconomic disadvantage and student violence in this study, a composite variable was derived from the set of five Census variables aggregated to school buffer zones with a one-kilometre radius. As was the case in Boyle and Lipman (2002), the variables included (1) percentage low-income economic families, (2) percentage female lone-parent families, (3) percentage of total neighbourhood income that came from government transfers, (4) percentage unemployed, and (5) the percentage of the population aged 20 years and older without a high school certificate.

The five socioeconomic disadvantage variables were standardized to have a mean of 0 and a standard deviation of 1 (z-score). The Disadvantage Score was calculated by taking an unweighted average of the five standardized variables. The variables are highly correlated and yield an Alpha coefficient of 0.81 which reflects a high degree of internal consistency between the variables.

School-neighbourhood police-reported crime rate: Based on Incident-based UCR2 data, total crime rates were calculated for each school-neighbourhood. The total crime rate included most *Criminal Code* offences and all offences under the *Controlled Drug and Substances Act*, but excluded offences under other federal statutes, provincial statutes and municipal by-laws. Also excluded were *Criminal Code* offences for which there was either no expected pattern of spatial distribution or a lack of information about the actual location of the offence. For example, administrative offences such as bail violations, failure to appear and breach of probation are typically reported at court locations; threatening or harassing phone calls are often reported at the receiving end of the call; and impaired driving offences are more likely to be related to the location of apprehension (for example, apprehension resulting from roadside stop programs).

Tests were conducted using separate variables for violent, property and drug crime rates. Since these results did not change the relationship between crime in the school-neighbourhood and student violent behaviour in the multilevel analysis, the overall measure of the total police-reported crime rate was used in the final models.

Correlations among neighbourhood and school variables are presented in Table 4. As might be expected, there are significant correlations between some variable pairs, e.g., school disorder and school capital ($r = -0.34$, $p \leq 0.05$), and neighbourhood crime rate and socioeconomic disadvantage ($r = 0.25$, $p \leq 0.05$). Nonetheless, tests indicated that multicollinearity among the variables in models in this study was not an issue.

Table 4
Correlations among school and neighbourhood variables

	Neighbourhood socioeconomic disadvantage	Neighbourhood police-reported crime rate	School capital	School disorder
	correlation coefficient			
Neighbourhood socioeconomic disadvantage	1.00	...	...	...
Neighbourhood police-reported crime rate	0.25 **	1.00	...	...
School capital	-0.10	-0.17 **	1.00	...
School disorder	0.19 **	0.12	-0.34 **	1.00

** statistically different from the reference category $p \leq 0.05$
Note(s): Based on 149 schools and their surrounding neighbourhoods.
Source(s): Statistics Canada, International Youth Survey, 2006, Census, 2006 and Incident-based Uniform Crime Reporting Survey, 2006.

4.3.4 School-level variables: School climate characteristics

Ideally, when measuring the influence of larger contexts such as schools or neighbourhoods on individual behaviour and outcomes, one would use information from sources other than the survey measuring the outcome, for example, the Census or UCR2. In this study, measures of school climate were based on the aggregated responses of the students in each school who were also providing information about violent outcomes. To avoid possible bias resulting from having the same individuals providing outcome and context information, "non-self" mean scores were calculated for the two school climate variables based on recommendations by McQuestion (2003). In this case, each student's score for a school climate variable is a measure of the average score for the 'other' students in the school who responded to school climate items.

School capital: A non-self mean score was calculated based on students' responses to four questions about the perceived climate of the school: "If I had to move I would miss my school", "Teachers notice when I am doing well and let me know", "I like my school", and "There are other activities in school besides lessons (sports, music, theatre, dances)". In the resulting summed score, high values indicated a high level of school capital and low values indicated a low level.

School disorder: A non-self mean score was calculated based on students' responses to four questions about the perceived climate of the school: "Many things are broken or vandalised in my school", "There is a lot of stealing in my school", "There is a lot of fighting in my school", and "There is a lot of drug use in my school". In the resulting summed score, high values indicated a high level of school disorder and low values indicated a low level.

4.4 Multilevel analysis

In the study, students were grouped within schools. Statistically, it is necessary to use techniques that consider the possible dependence of individuals clustered in the same area. Conventional regression analysis techniques assume that individual observations are independent from one another. If this assumption is violated, estimates of the regression coefficients can be biased and standard errors may be underestimated. Multilevel regression

techniques make it possible to take into account the possible dependence of the outcome variable among people in the same neighbourhood (Raudenbush and Bryk 2002; Snijders and Bosker 1999).

In this study, a series of multilevel logistic regression models were estimated to investigate variation in the chances of self-reported acts of violent delinquency among students attending Toronto schools. As an initial step, the 'empty' model (i.e., containing no explanatory variables) provided an estimate of the expected probability of violent delinquency for a student with average background characteristics, as well as an estimate of how much variation in violent delinquency existed among schools. In the second stage of analysis, a model assessed whether school variation in violent delinquency was associated, separately, with school-neighbourhood, school climate or individual-level factors. And in the final stage of analysis, a full model assessed whether school-neighbourhood and school climate factors were associated with the chances of self-reported violent delinquency over and above the influence of students own risk factors for violent behaviour.

4.5 Calculating between-school variation in prevalence of violent delinquency

Table 3 presented violent delinquency prevalence rates in an average or 'typical' school in Toronto for the empty and adjusted models. The following calculations were undertaken to estimate the average prevalence rate and the corresponding 95% prediction interval. Using the empty model as an example, the expected odds ratio of violence was 0.15, corresponding to an expected log-odds of violent delinquency of,

natural log (0.15) = -1.90.

This corresponds to an average school probability of,

1/(1+exp(1.90)) = 0.13, or roughly, 13%.

Assuming that schools' log-odds of violent delinquency are approximately normally distributed with a mean of 1.90 and variance of 0.215, it can be expected that 95% of schools have values between,

-1.90 ± 1.96 *sqrt(0.215) = (-2.793 and -0.977).

Converting these log-odds to probabilities indicates that about 95% of schools fall between the ranges of 0.058 and 0.274, or about 6% and 27%. For a more detailed explanation see Raudenbush and Bryk (2002).

4.6 Odds ratio

When an outcome variable for a regression model has two categories, for example, committing a violent act in the past 12 months versus not doing so, researchers are interested in determining the probability of the occurrence of that event under a particular set of circumstances, for example, being male, having low monitoring parents, or friends who support criminal behaviour. In this case logistic regression is the most appropriate technique to use. An odds ratio is a statistic generated by a logistic regression and can be used to assess whether, other things being equal, individuals with specific characteristics are more or less likely to report some outcome than those in another group, referred to as the reference category.

For example, if we consider the risk of violent delinquency for a male in comparison to a female (the reference category), an odds ratio near 1.0 implies there is no difference in violence between the two groups; an odds ratio less than 1.0 implies those in the group being considered (i.e. males) are less likely to report violence than those in the reference group (i.e. females) and an odds ratio greater than 1.0 implies those in the group being considered are more likely to report violence than those in the reference category.

4.7 Weighting procedure for variance estimation

The variance and standard errors of estimates in the description of Toronto students section (Table 1) were calculated using a set of Bootstrap weights develop by Statistics Canada for the 2006 IYS survey. The bootstrap method is

a way of approximating the sampling variance for complex survey designs (Rao and Wu 1988). For the IYS, a set of 250 student-level bootstrap weights is available. The sampling variance calculation using these weights involves calculating the estimates with each of these 250 weights and then calculating the variance of these 250 estimates.

Since the multilevel analyses in Table 3 take into account two levels of information—students nested within schools—a multilevel weighting scheme was required to calculate model parameters (Grilli and Pratesi 2004; Kovacevic et al. 2006). In addition to the set of 250 student level Bootstrap weights, an additional 250 weights were calculated for the school-level. Multilevel logistic regression models were run using a new SAS macro, BHLMSAS_V0, developed by Statistics Canada (Pierre and Saïdi 2008).

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